

Managing your water well in times of water shortage

There have been reports of a reference to help private well owners and groundwater users improve existing water supplies or correct groundwater supply problems. In case of water shortage, property owners should assess all available information before determining the best course of action.

Bedrock: solid rock underlying a loose material.

Overburden: lower material overlying the bedrock.

Aquifer: any geological formation or material capable of yielding water in usable quantities either in the bedrock or the overburden.

All Ontario residents need an adequate water supply that is available at a constant and dependable rate. There are two principal water sources: *groundwater*, which includes wells and springs; and *surface water*, which includes natural and manufactured lakes, rivers and streams.

When a well is to be built, an examination of all available water well and hydrogeological records is necessary to determine the most suitable groundwater source.

Wells must be properly installed and maintained to ensure a continuous, safe supply of water.

Groundwater

Groundwater is formed when rain or other precipitation infiltrates the soil and moves down until it reaches the point of saturation. Water fills in the porous spaces between grain particles and fractures in rock. The upper surface of the zone of saturation is called the water table. The depth of the water table depends on the nature of geological materials, the season and the slope of the ground.

The water table level varies from less than a metre below the surface to more than 50 metres. In the zone of saturation, any geological material or formation that is capable of yielding water to wells in usable quantities is called an aquifer. Aquifers may be found in the bedrock as well as in the overburden overlying the bedrock. In the

overburden, aquifers consist of materials such as sand and gravel. A coarse saturated gravel formation makes a good aquifer, while a very fine sand and silt formation is indicative of a poorer aquifer that yields water slowly. Aquifers vary in thickness and size. Some may be able to meet the water needs of only a few households, while others can supply entire communities with water.

Water shortages

Water shortages can be caused by a number of different things, including human activities, increased usage and climatic conditions. Often, water shortages are the result of too little precipitation over an extended period of time, usually a season or more. Other climatic factors such as higher than normal temperatures, high winds and low humidity can exacerbate the situation.

In periods of water shortage, water levels in shallow wells can have large fluctuations due to climatic conditions. Ground water levels are usually highest during April, as a result of precipitation, and then gradually decline until late September or October. Shallow wells are most vulnerable in dry weather conditions. In extreme cases, water tables will drop below the bottom of the well, resulting in complete loss of water supply.

Questions and answers

The following questions and answers have been prepared to help well owners assess their ground water systems. This information is essential for dealing with groundwater shortages, and gives some options for remediation and/or relief.

Should the top of my well be visible?

A well must always be visible to ensure easy access if remedial work to the pump, or other emergency work, must be done immediately.

You should determine the exact location of the well if you do not already know where it is. This will help when you need to replace any pumping or other equipment. It is advisable to have the casing raised to a minimum height of 40 cm above the ground surface.

How can I measure my well's performance?

The best way to monitor your well's performance is to measure the depth of the water from the top of the well. Regular water level measurements and records will help you analyze any future problems. Record this information, and keep it near your pressure system for quick access.

Measure depth to water (feet/in.)

Date: _____ (feet/in.): _____

Date: _____ (feet/in.): _____

Is it OK to add surface water or rain water to my well?

Adding water to your well is not recommended. It could contaminate your supply, and will not alleviate your water shortage problems during drought conditions.

If you have added any water of unknown quality, or suspect the quality of the water in your well, you should have the water tested immediately to make sure it is safe to drink.

If I increase my pump size, will my supply of water increase?

You can increase pump size for increased water supply, but it is essential that the pump should not exceed the maximum safe pumping capacity of the well or the specific height to which the pump must raise water.

If your pump is the correct size, and operating properly, replacing it with one that is too large may cause severe damage to the well. This is particularly true in small-diameter drilled wells.

Putting a pump with increased pumping capacity into a large-diameter dug or bored well will not provide more water. It will only provide the same amount of water at a faster rate, and your water supply will remain unchanged.

What about the depth to the pump intake in my well?

By knowing the exact depth of your well, as well as the depth of the pump intake, you can maximize the performance of your well. You should keep a record of this important information near your pressure system.

You may find that your pump intake is located too far above the bottom of the well. Lowering it will provide more draw down during pumping, providing more available water. NOTE: The pump intake should not be lowered to the very bottom of the well.

What should I do if my well is not providing as much water as usual?

If this is the first time you have experienced a water shortage you should check your pump and pressure system for mechanical failure. You should also check your water level, and start keeping a record of water levels in your well.

If you have experienced water shortages in the past, try to remember if they happened

during local or regional dry conditions. If not, water shortages may indicate problems associated with your well or pump/pressure system or to the size of the aquifer that your well taps into.

There is more than one well on my property. Why would they have been built?

Previous owners may have experienced water shortages or problems with their existing well(s), and replaced or added to their supply of wells.

How can I obtain water well records for the wells on my property?

If your well was reported to the ministry when it was constructed, you can get its record from the Ministry of the Environment. Call the ministry at 1-888-396-WELL for a certified copy of your record(s). A search charge of \$20.00 is applicable.

Once you have the records for a well, note the information on its construction, the static water level at the time of construction, the specific capacity of the well and the pump setting depth. Then note any changes that have occurred since it was built. The information contained in your record may serve as good baseline information in the assessment of your site specific conditions.

How can I be sure the pump and pressure system in my well are functioning properly?

You should have your pump and pressure system checked regularly by qualified professionals, and repaired if necessary, to ensure they are not the source of your water shortage problem. The age and condition of your pump and pressure system may directly affect the supply of water from your well. It is advisable to also check your distribution system (water lines) for leaks, clogging etc.

I'm using more water than I used to. Could this affect my water supply?

Yes. Water shortages are sometimes a direct result of increased water usage. When a well is built there is a calculated maximum safe yield that it can produce. Pump and pressure systems are selected to match the specific capabilities of the well. If water demand increases, and exceeds the maximum safe yield of the well, problems are likely, including water shortages. You can find out if this is the cause of the problem by checking the well's static water level.

Could my water shortage be the result of increased use of water in the area?

You can ask your nearest Ministry of the Environment regional office for information about increased water takings in your area. But first make sure that:

- your water shortage is not caused by local or regional climatic conditions
- you have not increased your own water consumption
- you have eliminated your pump/pressure system as the cause
- you have eliminated any other possible causes of your water shortage as identified above
- you have confirmed that your static water level is lower than normal

Could the remedial work I've done on my well affect its water supply?

Remedial work – such as the replacement of a pump, changes to the pump setting depth or to the diameter of the well (liner installations), or well rehabilitation (screen work) – can have an effect on your water supply. You may want to check with your contractor to establish whether any water yield changes could be expected as a result of the work.

What about work in the vicinity of my well?

Development in the vicinity of your well, such as paving or building construction, could affect the ground surface around your well – the ability of the ground to absorb water may be impaired.

If I need a new well to provide more water, what type of well should I construct?

If you need to build a second or replacement well you should review water well records and other hydrogeological information for your area. This will give you essential information such as depth to water pumping test data and static water levels, which in turn will help you determine the type of well you should build. Call 1-888-396-9355 to obtain these records.

Will deepening my existing well provide more water?

In some circumstances making your existing well deeper can provide more water. You may find additional groundwater and also provide additional draw down. However, caution should be exercised if the area is known to have poor quality natural water at depths lower than high quality fresh water. If this is the case, deepening the well and penetrating a formation with poor quality water may cause contamination to the freshwater formation. This could make your well unusable and cause wider contamination of a previously high quality aquifer, as well as have long term impacts on other wells in the area.

What are my responsibilities regarding wells on my property?

Well owners are obliged to maintain all wells on their properties. If a well is not being properly maintained, the well owner must have it plugged. Secure caps and lids must

be maintained on the top of any well which is not plugged. If you are unsure of the condition of the well cap or lid, have it inspected by qualified personnel and replaced or upgraded if necessary. This is to help protect and preserve ground water resources and minimize safety risks. Regulation 903 details all requirements regarding well construction, maintenance and abandonment.

How do I measure the static water level in my well?

Important: Do not pump water for several hours before you measure your well's static water level, or you will get a false reading.

Measure the water level with a survey tape or electrical measuring tape especially designed to measure water levels. You can make a home-made electrical measuring tape by using plain electrical wire with both ends exposed. Connect an ohmmeter to the upper end of the wire, and lower the wire into the well. When the bottom end of the exposed wire penetrates water it will move the meter at the upper end, because a closed circuit has been created. Mark this point on the wire with a small piece of tape. Then remove the wire from the well, and measure from the bottom of the wire to the exact point where the meter moved. This will tell you where the water level is below the top of the casing. If you repeat the process and obtain the same measurements, the water level is static. If the water level is moving up or down, continue to measure until you have at least two consecutive identical water levels.

This electrical device should be used only for measuring water levels in a well and should not be connected to any other electrical device or outlet.

Remedial options to consider during periods of drought

Implement water conservation practices. A thorough review of your water consumption practices and an assessment of all the components in your pressure and plumbing system may show where significant savings and improvements are possible. Efficiencies can be realized by all water consumers, whether their uses are domestic, commercial or agricultural.

Lower your pump or pump intake deeper into the well. Before making any adjustment to the pump intake depth, you should check your pump's specifications, or consult a licensed well contractor, to determine the maximum recommended depth and pumping rate for your well. Lowering the intake depth could directly affect the pumping rate and efficacy of your pump.

Change your pump. If your existing pumping equipment cannot achieve the recommended pumping rate, consider a larger pump. It is very important, however, that the larger pump should not exceed the maximum safe pumping rate for the well. Too large a pump could cause irreparable damage to your well. A qualified pump supplier or well contractor should be consulted to determine your specific needs.

Increase pressure tank size. A larger (or additional) pressure tank will provide additional water storage in the pressure system. This additional storage may provide sufficient water during a dry period.

Rehabilitate your well. If, before drought conditions existed, your well exhibited decreased yield while maintaining its static water level, it could be an indication of partial plugging of the bottom of your well. This is particularly true of drilled wells or drilled wells with screens. A well contractor

familiar with the different causes of well plugging and rehabilitation methods will tell you what is needed, possibly including pre-treatment pumping tests and water analysis.

Deepen the existing well. If your area is experiencing water shortage as a result of drought conditions, before making the decision to deepen your well you should review water well records and/or hydrogeological information for your immediate area.. They will help you establish whether fresh water aquifers exist at depths below the depth of your well. Water well records are available from the Ministry of the Environment (1-888-396-WELL).

Put in a temporary above-ground water storage tank. If your water shortage or increased shortage needs are temporary, an above-ground water storage tank can provide short term relief. Be sure to check that the source of the water to be stored is potable, and test it at regular intervals. Frost protection for above ground storage tanks and temporary water lines may be necessary during cold periods.

Construct a new well. If you have done remedial work on your well and continue to experience water shortage problems, you may consider building a new well. Before deciding on a new well you should review water well records and/or hydrogeological information for your area in order to locate additional aquifers on your property.

Before finalizing a contract with a well contractor, make sure that he or she has valid Ministry of the Environment licences of the proper prescribed class(es), and will construct the well in full compliance with Regulation 903 - Water Wells.

It is also highly recommended that you select a contractor who can provide reference checks with previous clients in your area, and is willing to sign a written contract.

Safety issues

If you will be doing any work in or around your well you should be aware of several important safety issues:

Never enter a well pit without taking safety precautions.

A well pit is an enclosed and confined space where natural gases can displace oxygen. Entering such a well pit could result in suffocation. Also, if natural gases such as methane are present, explosions can occur.

Secure well covers and/or caps must be replaced after any work has been conducted on a well.

It is essential that wells are properly covered to prevent accidents and injury.

Turn off all electrical power going to your well, pump and pressure system or pump house before measuring the water level to avoid the risk of shock or electrocution.

Ensure good ventilation.

Methane gas can be explosive, so if your well water contains methane gas, there must be good venting to the outside atmosphere for the entire pressure system.

Useful publications

The following publications are available from the Ministry of the Environment's Public Information Centre:

- Protection of Water Quality in Drilled Wells; 602b
- Protection of Water Quality in Bored and Dug Wells; 601b
- Water Wells and Ground Water: Recommended Methods for Plugging Abandoned Water Wells; 3702e
- Water Wells in Ontario; Important Facts About Water Well Construction; 587b
- Water Wells in Ontario: Installation of Well Pumps; 594b
- Water Wells and Ground Water Supplies in Ontario; 589e (currently being revised as of July 1999)

